

A new melanopsid (Gastropoda) species from the middle Miocene Kupres Basin (Bosnia and Herzegovina)

Thomas A. Neubauer¹

Oleg Mandić

Mathias Harzhauser

Geological-Paleontological Department

Natural History Museum Vienna

1010 Vienna, Austria

thomas.neubauer@nhm-wien.ac.at

mathias.harzhauser@nhm-wien.ac.at

oleg.mandic@nhm-wien.ac.at

ABSTRACT

Melanopsis fateljensis (Caenogastropoda: Cerithiimorpha: Melanopsidae) is described as a new species from the early Middle Miocene lacustrine deposits of the Kupres Basin. Similarities to other co-occurring melanopsids are discussed. Its unique morphology, in particular the elongate, stepped spire with prominent spiral bulges, clearly distinguishes the new species from all other Melanopsidae known from the Neogene of Europe.

Additional Keywords: *Melanopsis*, freshwater gastropod, new species, Dinaride Lake System, Langhian

INTRODUCTION

Recently, Neubauer et al. (2013a) provided a taxonomic revision of the molluscan fauna of the Kupres Basin in Bosnia and Herzegovina, which was only poorly known by then (Brusina, 1902; Kochansky-Devidé and Slišković, 1981; Jurišić-Polšak and Slišković, 1988). The long-lived freshwater lake present in this basin during the early middle Miocene is part of the Dinaride Lake System, a collective of early to middle Miocene freshwater lakes in the Dinaride Mountain Chain (Figure 1; Krstić et al., 2003; Harzhauser and Mandić, 2008; De Leeuw et al., 2012; Mandić et al., 2012). The well-preserved fauna proved to be highly endemic, with two genera and five species newly described and 30% of the fauna endemic to Lake Kupres. Even well-studied coeval, nearby lakes, like Lake Sinj (Neubauer et al., 2011) and Lake Gacko (Neubauer et al., 2013b), showed only a low faunistic affinity, with a maximum of 38.9% of shared taxa. Another striking feature was the high percentage of sculptured morphologies, including

teleoconch microsculpture in one species, interpreted as a reaction to the oversaturation of calcium carbonate in the water under the existing alkaline, hard-water conditions (e.g., West et al., 1991).

Shortly after, another taxonomic work on the ostracod and gastropod fauna of the region around Kupres was published by Krstić et al. (2013). This study dealing with an outcrop located about 2 km ENE of Fatelj Hill revealed a different assemblage with species known from the Sinj, Drniš, and Gacko basins (Figure 1) and none of those described by Neubauer et al. (2013a). The fauna is characterized by few species of the genera *Gyraulus*, *Fossarulus*, *Bania*, and “*Pseudamnicola*” (both occurring species were recombined with *Bania* by Neubauer et al., 2013a). Such a faunal composition with pulmonate and typical pioneer species corresponds to those found in the Gacko and Sinj basins and points to rather stressed, ephemeral conditions at the basin margin in this particular stratigraphic level (Mandić et al., 2009; 2011; Neubauer et al., 2011; 2013b). These deposits were classified as “Ottangian” (middle Burdigalian) by Krstić et al. (2013), but should rather be placed in the early Langhian as discussed by Neubauer et al. (2013a).

The aim of the present study is to fix a misidentification of a melanopsid species by Neubauer et al. (2013a). Our taxonomic reinvestigation revealed clear differences to the species with which the taxon was previously identified in Neubauer et al. (2013a) and to all other melanopsids known from the European Neogene, urging the description of a new species.

MATERIALS AND METHODS

The material derives from an outcrop at the northwestern slope of a small hill, termed Fatelj, about 4 km SW of the town Kupres in Bosnia and Herzegovina (43°58'17.2" N, 17°14'06.9" E, 1140 m). The section is approximately 3 m thick and covers three lithological units briefly discussed

¹ Corresponding author

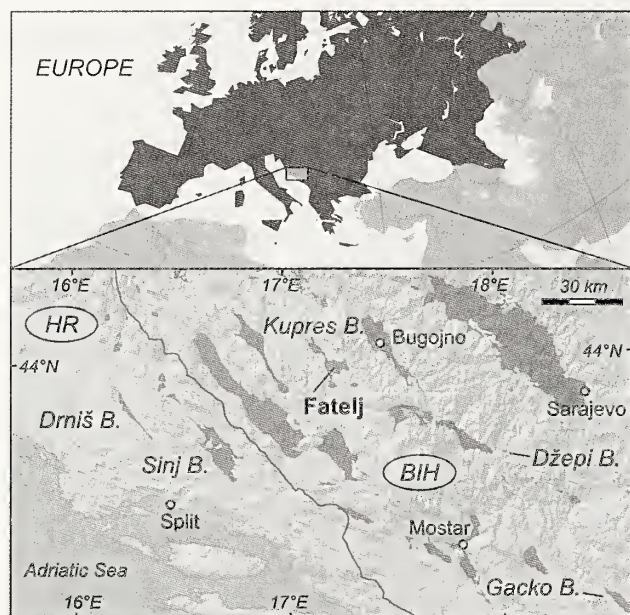


Figure 1. Geographical overview over the study area with indication of the main sedimentary basins harboring paleolakes mentioned in the text (modified after Neubauer et al., 2013a).

in Neubauer et al. (2013a). An age of the deposits of 15.5 ± 0.2 Ma (= early Langhian or early Badenian in terms of regional Paratethys stages) is suggested by the appearance of the dreissenid bivalve *Mytilopsis aletici* (Brusina, 1907), which is a good biostratigraphic marker due to the rapid evolution of these bivalves in the Dinaride Lake System (Kochansky-Devidé and Slišković, 1978, 1981; De Leeuw et al., 2010; Harzhauser and Mandić, 2010). Eleven samples were taken from units 1 and 3. Samples 090709/4 and 090709/5, containing the herein investigated species, were treated with diluted hydrogen peroxide and washed through two sieves with 2 mm and 0.5 mm mesh size. When necessary, specimens were cleaned from sediments with an ultrasonic device. The material is stored in the collection of the Natural History Museum of Vienna, Austria (NHMW 2011/0138).

SYSTEMATIC PALEONTOLOGY

Class Gastropoda Cuvier, 1795
 Subclass Caenogastropoda Cox, 1960
 Order Cerithiimorpha Golikov and Starobogatov, 1975
 Superfamily Cerithioidea Fleming, 1822
 Family Melanopsidae H. Adams and A. Adams, 1854
 Subfamily Melanopsinae H. Adams and A. Adams, 1854

Genus *Melanopsis* Férussac, 1807

Melanopsis fateljensis new species (Figures 2–11)

Melanopsis sp.—Brusina, 1902: pl. 29, figs 23–26.

Melanopsis mojsisovicsi (Neumayr, 1880) comb. nov.—
 Neubauer et al., 2013a: 137, figs 5E–F, I–K (non
Melanoptychia Mojsisovicsi Neumayr, 1880).

Diagnosis: Shell conical, with elongate and distinctly stepped spire, with strong bulges below the sutures and a marked shoulder between whorl flank and base; aperture small, ovoid, with very small anterior canal.

Description: Shell high-conical, slender, elongate, with 7–10 whorls; proportions variable, with broader shells sometimes present. Protoconch bulbous, dome-shaped, highly convex; number of whorls unknown; initial part elevated, not covered by successive whorls; surface smooth. First few shell whorls form regularly conical outline; beginning about with fifth whorl, weak shoulder emerges near upper suture; shoulder increases in strength incrementally, eventually forming a broadly convex bulge. At transition of whorl flank to base, marked angle occurs, forming second, weaker bulge; weak and broad concavity is formed between both bulges, only visible on last 1–2 whorls. Upper bulge may have irregular course at upper suture in some specimens. Last whorl reaching 60–70 % of total height; base straight. Aperture small, slender-ovoid, with anterior and posterior tip forming acute, almost rectangular angles; callus weakly expressed, glossy; outer lip sharply terminated, not reflected; siphonal canal very short and narrow, not extended or reflected; fasciole narrow, very weak. Growth lines prosocylt to slightly sigmoidal (because of bulges), usually indistinct; occasionally and/or temporarily more prominent (Figures 9–10). Coloring very rarely preserved, consisting of thin, vertical to slightly sigmoidal, moderately-spaced, dark yellow to orange lines; occasionally they form widely-spaced zigzag-lines on earlier whorls (penultimate whorl upwards; see Figure 6).

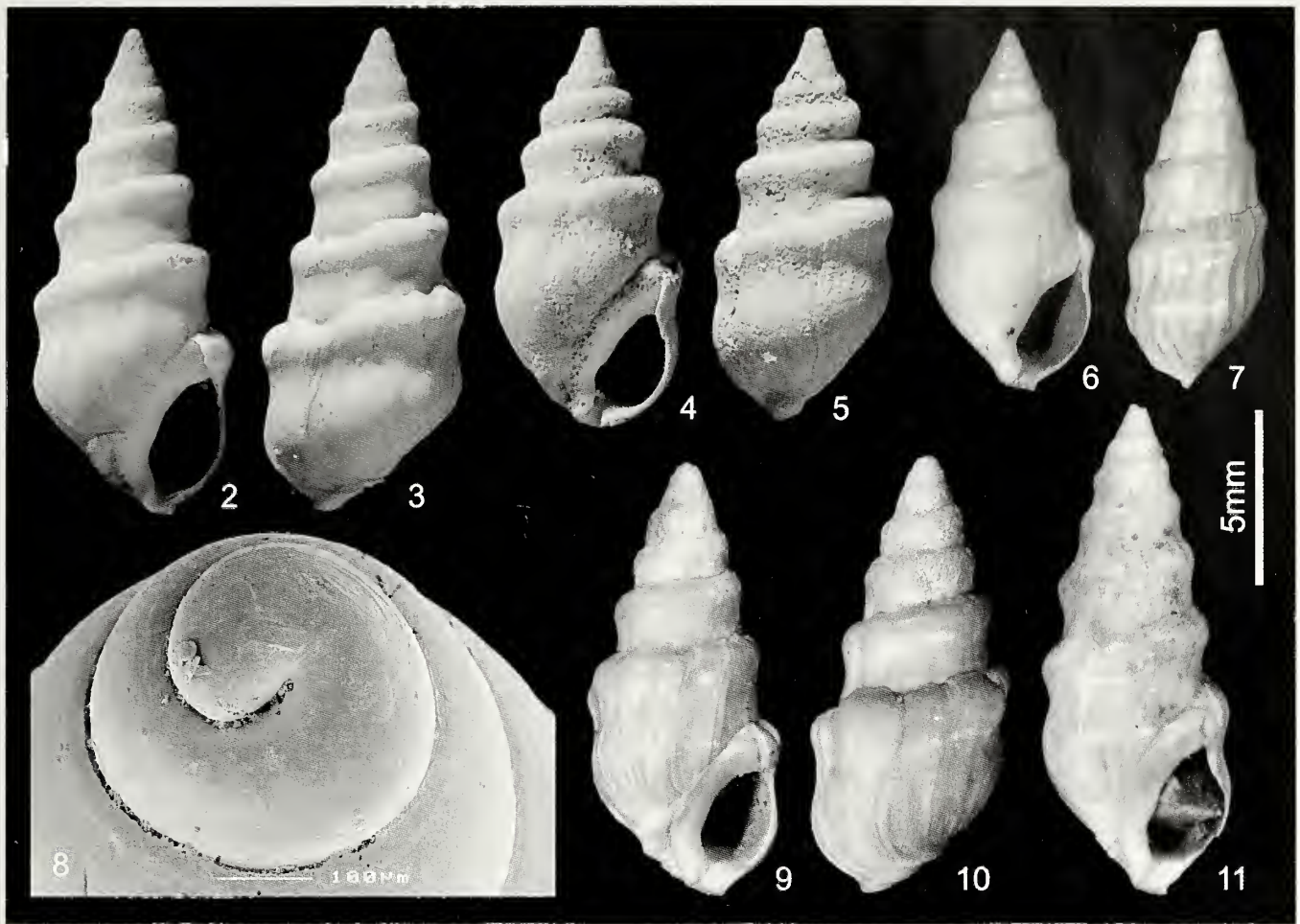
Type Material: Holotype (Figures 2–3), NHMW 2011/0138/0107a, 13.97 mm height \times 5.80 mm width; Paratype 1 (Figures 4–5), NHMW 2011/0138/0107b, 11.49 mm height \times 5.45 mm width; Paratype 2 (Figures 9–10), NHMW 2011/0138/0184, 12.41 mm length \times 5.61 mm width.

Additional Measurements: 10.47 mm height \times 4.74 mm width (Figure 6); 10.39 mm height \times 4.17 mm width (Figure 7); 14.10 mm height \times 5.47 mm width (Figure 11); 13.72 mm height \times 5.41 mm width; 15.01 mm height \times 5.67 mm width; 12.75 mm height \times 6.17 mm width.

Type Locality: NW slope of Fatelj hill near Kupres, —Bosnia and Herzegovina.

Stratum Typicum: Lower middle Miocene (= lower Langhian, lower Badenian).

Material Examined: Several hundred specimens from debris collection of Unit 3, 20 from sample 090709/4 and



Figures 2–11. *Melanopsis fateljensis* Neubauer new species, from the early middle Miocene of the Fatelj hill, Kupres Basin, Bosnia and Herzegovina. 2–3. Holotype (NHMW 2011/0138/0107a). 4–5. Paratype 1 (NHMW 2011/0138/0107b). 6. Specimen showing zigzag pattern on penultimate whorl (NHMW 2011/0138/0185). 7. Specimen with preserved coloration (NHMW 2011/0138/0186). 8. Protoconch view (NHMW 2011/0138/0107c). 9–10. Paratype 2 (NHMW 2011/0138/0184). 11. Elongate specimen (NHMW 2011/0138/0187). All illustrated specimens are from sample 090709/7 (debris collection of Unit 3).

a single specimen from sample 090709/5, all from the type locality.

Etymology: The new species is named after the type locality.

Geographic Distribution: So far only known from the Kupres Basin.

Taxonomic Remarks: This species is based on a misidentification by Neubauer et al. (2013a), whom erroneously identified the present material as *Melanopsis mojsisovicsi* (Neumayr, 1880) described from the roughly coeval locality Džepi (Bosnia and Herzegovina). A direct comparison is unfortunately impossible as the type material of *M. mojsisovicsi* has been lost. Other material available from Džepi and the descriptions and illustrations of Neumayr (1880) still show the differences quite clear. *M. mojsisovicsi* has a much higher last whorl and lacks the subsutural bulges so distinct for *M. fateljensis*. The columellar fold typical for *M. mojsisovicsi* is absent as

well. The two specimens illustrated in Brusina (1902: pl. 29, figs 23–26) as “*Melanopsis* sp.” correspond fully to the present species. *Melanopsis filifera* Neumayr, 1880 from the early middle Miocene deposits of Drvar (Bosnia and Herzegovina) also differs in a larger last whorl and a weakly to non-stepped spire. Aside from these we are not aware of any other melanopsid species similar to *M. fateljensis*.

ACKNOWLEDGMENTS

We thank Medina Mandić (Vienna) for assistance in the field and Alice Schumacher (Natural History Museum Vienna) for support with the photographs. We are grateful to Vitaliy V. Anistratenko (Schmalhausen Institute of Zoology of NAS, Ukraine) for his constructive review. The work contributes to the project “Freshwater Systems in the Neogene and Quaternary of Europe: Gastropod Biodiversity, Provinciality, and Faunal Gradients” financed by the Austrian Science Fund (FWF project no. P25365-B25).

LITERATURE CITED

- Bandel, K. 2000. Speciation among the Melanopsidae (Caenogastropoda). Special emphasis to the Melanopsidae of the Pannonian Lake at Pontian time (Late Miocene) and the Pleistocene and Recent of Jordan. *Mitteilungen aus dem Geologisch-Paläontologischen Institut der Universität Hamburg* 84: 131–208.
- Brusina, S. 1902. *Iconographia Molluscorum Fossilium in tellure tertiaria Hungariae, Croatiae, Slavoniae, Dalmatiae, Bosniae, Herzegovinae, Serbiae and Bulgariae inventorum*. Officina Soc. Typographicae, Agram, 30 plates.
- De Leeuw, A., O. Mandić, A. Vranjković, D. Pavelić, M. Harzhauser, W. Krijgsman, and K.F. Kuiper. 2010. Chronology and integrated stratigraphy of the Miocene Sinj Basin (Dinaride Lake System, Croatia). *Palaeogeography, Palaeoclimatology, Palaeoecology* 292: 155–167.
- De Leeuw, A., O. Mandić, W. Krijgsman, K. Kuiper, and H. Hrvatović. 2012. Paleomagnetic and geochronologic constraints on the geodynamic evolution of the Central Dinarides. *Tectonophysics* 530–531: 286–298.
- Harzhauser, M., T. Kowalke, and O. Mandić. 2002. Late Miocene (Pannonian) Gastropods of Lake Pannon with Special Emphasis on Early Ontogenetic Development. *Annalen des Naturhistorischen Museums in Wien* 103A: 75–141.
- Harzhauser, M. and O. Mandić. 2008. Neogene lake systems of Central and South-Eastern Europe: Faunal diversity, gradients and interrelations. *Palaeogeography, Palaeoclimatology, Palaeoecology* 260: 417–434.
- Harzhauser, M. and O. Mandić. 2010. Neogene dreissenids in Central Europe: evolutionary shifts and diversity changes. In: Van der Velde, G., S. Rajagopal, and A. Bij de Vaate (eds.) *The Zebra Mussel in Europe*. Backhuys Publishers, Leiden/Margraf Publishers, Weikersheim, pp. 11–29.
- Jurišić-Poljak, Z. and T. Slišković. 1988. Slatkovodni gastropodi neogenskih naslaga jugozapadne Bosne. *Zbornik referata naučnog skupa "Minerali, stijene, izumrla i živi svijet BiH"*, Zemaljski Muzej Bosne i Hercegovine, Sarajevo, 7.-8. Oktobar 1988: 167–174.
- Kochansky-Devidé, V. and T. Slišković. 1978. Miocenske kongerije Hrvatske, Bosne i Hercegovine. *Palaeontologia jugoslavica* 19: 1–98.
- Kochansky-Devidé, V. and T. Slišković. 1981. Mlade miocenske kongerije Livanjskog, Duvanjskog i Kupreškog polja u jugozapadnoj Bosni i Hercegovini. *Palaeontologia jugoslavica* 25: 1–25.
- Krstić, N., L. Savić, G. Jovanović, and E. Bodor. 2003. Lower Miocene lakes of the Balkan Land. *Acta Geologica Hungarica* 46: 291–299.
- Krstić, N., G. Jovanović and L. Savić. 2013. Jezerski ostrakodi i prateći mekušci iz kupreškog polja, donji dio dinaridskog sistema jezera (Otnang) na visini od 1,150 m. *Zapisnici Srpskog Geološkog Društva* 2011: 1–25.
- Mandić, O., D. Pavelić, M. Harzhauser, J. Zupanić, D. Reischenbacher, R.F. Sachsenhofer, N. Tadej, and A. Vranjković. 2009. Depositional history of the Miocene Lake Sinj (Dinaride Lake System, Croatia): a long-lived hard-water lake in a pull-apart tectonic setting. *Journal of Paleolimnology* 41: 431–452.
- Mandić, O., A. De Leeuw, B. Vuković, W. Krijgsman, M. Harzhauser, and K.F. Kuiper. 2011. Palaeoenvironmental evolution of Lake Gacko (Southern Bosnia and Herzegovina): Impact of the Middle Miocene Climatic Optimum on the Dinaride Lake System. *Palaeogeography, Palaeoclimatology, Palaeoecology* 299: 475–492.
- Mandić, O., A. De Leeuw, J. Bulić, K.F. Kuiper, W. Krijgsman, and Z. Jurišić-Poljak. 2012. Paleogeographic evolution of the Southern Pannonian Basin: 40Ar/39Ar age constraints on the Miocene continental series of northern Croatia. *International Journal of Earth Sciences* 101: 1033–1046.
- Neubauer, T.A., O. Mandić, and M. Harzhauser. 2011. Middle Miocene Freshwater Mollusks from Lake Sinj (Dinaride Lake System, SE Croatia; Langhian). *Archiv für Molluskenkunde* 140: 201–237.
- Neubauer, T.A., O. Mandić, M. Harzhauser, and H. Hrvatović. 2013a. A new Miocene lacustrine mollusc fauna of the Dinaride Lake System and its palaeobiogeographic, palaeoecologic, and taxonomic implications. *Palaeontology* 56: 129–156.
- Neubauer, T.A., O. Mandić, and M. Harzhauser. 2013b. The Middle Miocene freshwater mollusk fauna of Lake Gacko (SE Bosnia and Herzegovina): taxonomic revision and palaeoenvironmental analysis. *Fossil Record* 16(1): 77–96.
- Neumayr, M. 1880. V. Tertiäre Binnenmollusken aus Bosnien und der Hercegovina. *Jahrbuch der kaiserlichen und königlichen geologischen Reichsanstalt* 30(2): 463–486.
- West, K., A. Cohen and M. Baron. 1991. Morphology and behavior of crabs and gastropods from Lake Tanganyika, Africa: implications for lacustrine predator-prey coevolution. *Evolution* 45: 589–607.